CURRENT RESEARCH AND DEVELOPMENT IN BIOTECHNOLOGY ENGINEERING AT IIUM

VOLUME III

Editors:

Md. Zahangir Alam
Ahmed Tariq Jameel
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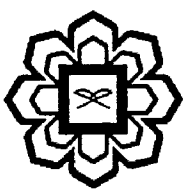

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CHAPTER 33

SINGLE STAGE STIRRED TANK BIOREACTOR PRODUCTION OF STAR FRUIT (*Averrhoa carambola*) VINEGAR

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and Mohd Nasir Jamaluddin Ab Rahaman

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ABSTRACT

Vinegar was produced in the lab from fermentation of local star fruit (*Averrhoa carambola*) juice in stirred tank bioreactor. The fermentation of star fruit juice into vinegar was produced by decomposing sugar contained in the fruit substrate through alcohol and acetic acid fermentation over a period of three days with the aid of two microorganisms, *Saccharomyces cerevisiae* and *Acetobactor aceti*. To Study THE optimization of the fermentation process, the parameter conditions used in the tank bioreactor are agitation speed, aeration and the concentration of glucose used. The design of the experiment was conducted using Design Expert software. Analysis at every 12 hours interval was carried for ethanol concentration, reducing sugar level and acetic acid. The findings in this project can be applied to produce vinegar in large amount from our local tropical star fruit juice. The experiment showed that the optimum conditions for agitation was 300 rpm, aeration at 0.5 Lpm and glucose concentration (20 %) consequently produced 1.63 % vinegar.

Keywords: *Averrhoa carambola*, Vinegar, Optimization, Bioreactor, Single Stage Fermentation

INTRODUCTION

Vinegar is a preservative that can be used to prevent brittleness in teeth, clean the innards of organs, against bacteria and parasites in our stomach (Zaghlul, 2006). Vinegar is a food product of increasing significance by virtue of its widely variable origin and uses particularly as a condiment or food preservative. The gastronomic value of vinegar has been appreciated for thousands of years (Jimenez-Hornero et al., 2009). Acetic acid is a chemical compound responsible for characteristic odor and sour taste of vinegar

In Malaysia the production of vinegar from local fruit has not been comercialized. It is clearly shown, the demand of vinegar is increasing rapidly not only in Malaysia but in the entire world. It is therefore important for the scientist in our country to develop an alternative way to produce vinegar from local tropical fruit.